



Prepared Statement

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before the

Senate Democrats' Special Committee on the Climate Crisis

*Quality Jobs, COVID And Lower Emissions:
Decarbonizing The Energy And Industrial Sectors
While Rebuilding The Economy And Expanding Opportunities For American Workers*

July 1, 2020

Chairman Schatz, Senator Smith and Members of the Senate Democrats' Special Committee on the Climate Crisis, thank you for inviting me here today to discuss the opportunities and challenges in the energy sector for helping to revive the U.S. economy during and after the coronavirus pandemic.

It was my honor to serve as the 13th Secretary of the U.S. Department of Energy (DOE) until January 2017. During my tenure as Secretary, I especially appreciated that Senators from both sides of the aisle came together on numerous occasions to support U.S. clean energy innovation.

Much of my career has focused on energy innovation. At the Massachusetts Institute of Technology (MIT), I founded the MIT Energy Initiative, which had a significant focus on innovation in a carbon-constrained environment and engaged all of MIT's schools because I am convinced that every discipline has a contribution to make for advancing the clean energy transition and social justice. As Secretary of Energy, I made clean energy innovation a cornerstone of the Department's initiatives and policy and greatly increased DOE's focus on energy jobs. Recognizing that climate change is an existential crisis, I played a central role in the development and launch of Mission Innovation, an initiative focused on doubling the federal clean energy innovation budgets of the U.S. and 25 other countries around the world. And I founded the Energy Futures Initiative where clean energy innovation, energy jobs and social equity is fundamental to all of our work.



I also wish to observe that COVID-19 and the resultant sudden economic recession and massive unemployment is one of two human tragedies at the forefront of our nation’s consciousness. The second is a heartbreaking recognition that the struggle for equal rights and racial justice – almost 60 years after Martin Luther King’s iconic “I Have a Dream” speech – still has a very long way to go. At the Energy Futures Initiative, we share these sentiments and believe that a strong economy, the clean energy transition and social justice are inextricably linked. There is little doubt that both COVID-19 and climate change impact minority communities first and worst. I encourage people to visit the EFI website to read our statement and action plan for accelerating and increasing our focus on these racial and social justice issues.¹

My testimony today focuses on:

- The Green *Real Deal*: A Framework for Growing Jobs and Addressing Climate Change
- The Labor Energy Partnership: An AFL-CIO and EFI Initiative
- The Impact of COVID-19 on Energy Jobs and the Potential Role of Energy Jobs in Economic Recovery
- The Role of the Clean Energy Transition and U.S. Job Growth

Key Takeaways

- EFI fully endorses the *Green New Deal* resolution in its emphasis on addressing climate change and social justice together.
- EFI developed the *Green Real Deal* to translate climate change and social justice principles into practice to guide our portfolio of activities. At the heart of the *Green Real Deal* is an emphasis on an “all-of-the-above” approach to reducing greenhouse gas emissions as rapid action on climate change must be borne of practicality, not ideology or wishful thinking on either side of the aisle. Also central to the *Green Real Deal* is that the low-carbon future must be just and equitable, including accommodating regional differences, and that coalition-building is essential to the success of the clean energy transition.
- The AFL-CIO and EFI formed the *Labor Energy Partnership* (LEP), a joint effort to develop a framework for the 21st century energy system that creates and preserves jobs while addressing the climate crisis. Our focus will be specifically on the development and commercialization of advanced clean energy technologies and associated job creation and retraining.

¹ The Energy Futures Initiative *Statement on Racial and Social Justice* can be found at: <https://energyfuturesinitiative.org/news/2020/6/12/an-efi-statement-on-racial-justice>



- For the last three years, EFI has partnered with National Association of State Energy Officials (NASEO) and BW Research Partnership to produce the annual *U.S. Energy and Employment Report* (USEER). According to the 2020 USEER, launched in March, the **Fuels, Power Generation, Transmission, Distribution & Storage, Energy Efficiency and Motor Vehicles Sectors employed 8.3 million Americans in 2019.**
- This year, we also launched *Five-Year Trends: The USEER 2016-2020* which found that from 2015-2019, the Fuels, Power Generation, Transmission, Distribution & Storage, Energy Efficiency and Motor Vehicles Sectors **generated 915,000 new jobs, outperforming overall US employment growth 2 to 1 – 12.4% vs 6%. Energy efficiency, which employed 2.4 million Americans in 2019, alone generated over 400,000 new jobs.**
- COVID-19 impacted the energy sector hard. **The energy sector lost about 1.3 million jobs as of the end of April, considerably more than five years of gains; almost half of those losses were in clean energy.**
- We will need **millions of new** jobs in order to climb out of the COVID-19-induced economic hole and most likely additional extraordinary actions by the Federal government. **Given the demonstrated track record of the energy sector as having considerable leverage for job creation, major investments in the clean energy transition – in any further stimulus actions and in appropriations - should have a high priority.**
- EFI has proposed, under the umbrella of an **energy jobs coalition, 22 specific clean energy measures under six priorities** (listed later in this testimony):
 1. Energy Efficiency and Climate Resilience Investment Initiatives
 2. Energy Infrastructure Investment Initiatives
 3. Clean Energy Technology Innovation Investment Initiatives
 4. Laying the Groundwork for the Clean Energy Industries of the Future
 5. Clean Energy Tax Incentives
 6. Workforce Development
- We know that continuing energy efficiency gains in buildings, transportation and industry make both environmental and economic sense.
- It is clear that the electricity sector is leading and will continue to lead the low carbon transition. To achieve carbon net zero by mid-century across the economy, the electricity sector will need to reach that point earlier, by 2040, and ideally even earlier, perhaps by 2035, because success in some of the harder to decarbonize sectors, such as transportation, buildings and industry, depend on expanded electrification.



- Natural gas will continue to play an important role throughout the transition, including as an enabler for rapid expansion of wind and solar deployment.
- The innovation budget for research, development and demonstration will need to **double or triple over this decade to position the U.S. for success in addressing the climate crisis and social equity challenges, and for establishing an unrivaled competitive position--with enhanced domestic supply chains--for a multitrillion-dollar global business.**
- **In conclusion, I strongly believe that a solution for our 2050 goals will require major breakthroughs in new technologies. We need a supercharged decade of across-the-board clean energy innovation, with no time to waste.**

The Energy Futures Initiative

My testimony today draws from the work of the Energy Futures Initiative (EFI), an organization I founded in April 2017 with two colleagues from my tenure as Energy Secretary: Melanie Kenderdine, Founder and Director of the Office of Energy Policy and Systems Analysis and Energy Counselor to the Secretary, and Joseph Hezir, who served as Chief Financial Officer and Senior Advisor to the Secretary.

EFI's mission focuses on research and analysis to explore the ways technology and policy innovation create clean energy jobs, expand the economy, enhance national and global energy security, and address the imperatives of climate change. To fulfill this mission, EFI produces unbiased and independent, data-driven reports for policymakers and the public that offer new insights into and recommendations on emerging energy issues. To have maximum impact, EFI identifies solutions that are effective, realistic, and sufficiently robust for adoption in these uncertain times. Over the last three years, EFI has published 15 reports addressing a broad range of energy challenges and opportunities, including four reports on U.S. energy jobs²:

1. *Five Year Trends: The U.S. Energy and Employment Report: 2016-2020* (March 2020)
2. *The 2020 U.S. Energy and Employment Report* (March 2019)
3. *The 2019 U.S. Energy and Employment Report* (March 2019)
4. *The 2018 U.S. Energy and Employment Report* (March 2018)
5. *Regional Clean Energy Innovation: Regional Factors for Accelerating the Development and Deployment of Climate Mitigation Technologies*, with the University of Maryland (February 2020)

² The U.S. Energy and Employment Reports (USEER) were produced in partnership with the National Association of State Energy Officials and BW Research Partnership. Previous editions (2016 and 2017) were published by the U.S. Department of Energy (DOE).



6. *Clearing the Air: A Federal RD&D Initiative and Management Plan for Carbon Dioxide Removal Technologies* (September 2019)
7. *The Green Real Deal: A Framework for Achieving a Deeply Decarbonized Economy* (August 2019)
8. *Optionality, Flexibility & Innovation: Pathways for Deep Decarbonization in California* (May 2019)
9. *Carbon Removal: Comparing Historical Federal Research Investments with the National Academies' Recommended Future Funding Levels, with the Bipartisan Policy Center* (April 2019)
10. *Advancing the Landscape of Clean Energy Innovation*, with IHS Markit (February 2019)
11. *Investing in Natural Gas for Africans: Doing Good and Doing Well* (November 2019)
12. *Promising Blockchain Applications for Energy: Separating the Signal from the Noise* (July 2018)
13. *Advancing Large Scale Carbon Management: Expansion of the 45Q Tax Credit* (May 2018)
14. *Leveraging the DOE Loan Program: Using \$39 Billion in Existing Authority to Help Modernize the Nation's Energy Infrastructure* (March 2018)
15. *The U.S. Nuclear Energy Enterprise: A Key National Security Enabler* (August 2017)

All EFI reports are publicly available at: <https://EnergyFuturesInitiative.org/efi-reports>. All U.S. Energy and Employment Reports are also available free at: www.USEnergyJobs.org.

The Green Real Deal: A Framework for Growing Jobs and Addressing Climate Change

Introduced in February 2019, the *Green New Deal Resolution* focused on the climate crisis and jump-started a national conversation on the imperatives of addressing climate change risks to the economy, environment, and national security. Equally important, the *Resolution* highlighted the significant and growing need to address social equity issues for disadvantaged communities that are least able to afford the costs of climate change.

EFI fully endorses the *Green New Deal's* focus on the simultaneous imperatives for achieving deep decarbonization and ensuring that social equity issues are central in the clean energy transition. Translating these overarching principles into practice was the objective of what we have termed the *Green Real Deal*. This concept was introduced in a March 2019 op-ed that I wrote with Andy Karsner, former DOE Assistant Secretary for Energy Efficiency and Renewable Energy during the George W. Bush Administration.

In August, 2019, EFI published a detailed plan that articulated the mission, principles and elements that could help operationalize a green real deal. This plan, *The Green Real Deal: A*

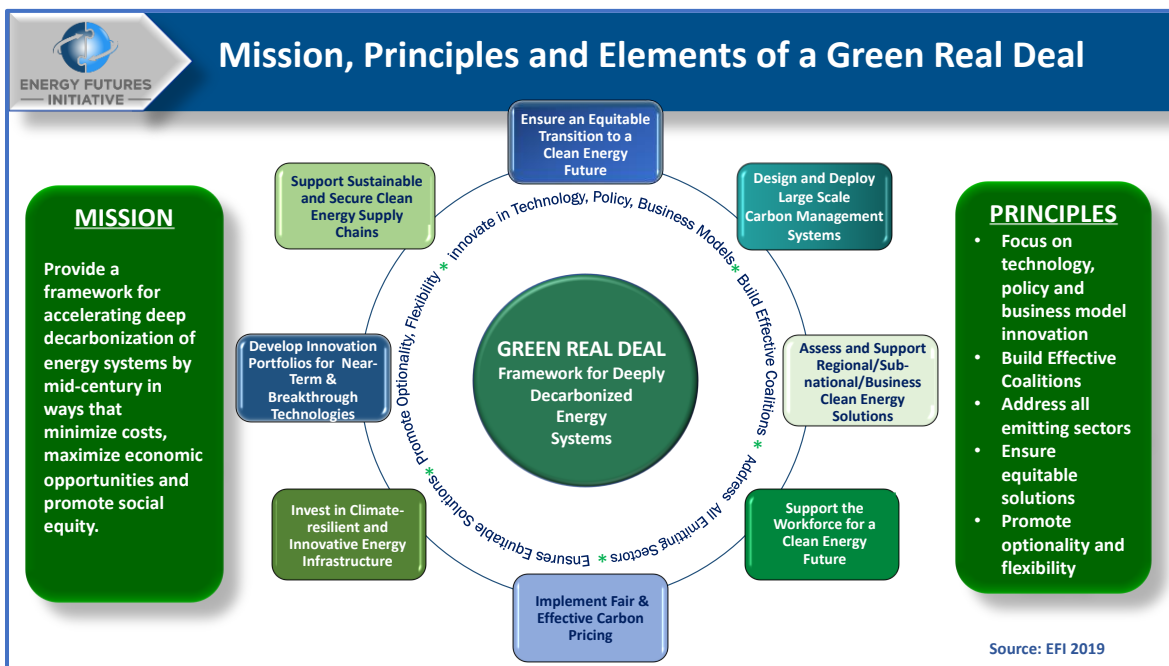


Framework for Achieving a Deeply Decarbonized Economy (GRD),³ guides our portfolio of activities at the Energy Futures Initiative.

The GRD offers an actionable framework for meeting deep decarbonization of energy and associated systems by midcentury in ways that minimize costs, maximize economic opportunities, accelerate solutions, and promote social equity. Illustrated by the schematic presented in Figure 1, this framework—starting from five broad-based principles and organized around eight high-level key elements—is designed to provide policymakers, stakeholders, and industry with the context and building blocks for prioritizing, selecting and implementing energy policy, technology and business model innovations to effectively accelerate economywide decarbonization.

At the heart of the GRD is an emphasis on an “all-of-the-above” approach to reducing greenhouse gas emissions as rapid action on climate change must be borne of practicality, not ideology or wishful thinking. A just and equitable low-carbon future must be founded on optionality, flexibility, and innovation to accommodate regional differences in energy resources, infrastructure, jobs, technology needs and costs.

FIGURE 1. MISSION, PRINCIPLES AND ELEMENTS OF A GREEN REAL DEAL



³ Hyperlink: [The Green Real Deal: A Framework for Achieving a Deeply Decarbonized Economy.](#)



The GRD is guided by five principles. These are highlighted and further described in Table 1, The Green Real Deal: Principles and Description.

Table 1. The Green Real Deal: Principles and Description	
<i>Principle #1 Broad and inclusive coalitions must be built.</i>	Solutions for addressing the climate challenge cut across all portions of the economy and require participation of businesses, labor, financial institutions, religious and military leaders, consumers, governments, and advocacy groups.
<i>Principle #2 Social equity is essential for success.</i>	The transformation of energy and associated systems must also improve lives, grow public acceptance of the widespread change required to address climate change, and provide meaningful, well-paying jobs. The GRD subscribes to the National Academy of Public Administration’s definition of social equity:
<i>Principle #3 All GHG emitting sectors must be addressed in climate solutions.</i>	Electricity is responsible for only 28 percent of U.S. emissions and is arguably the easiest to decarbonize. Sectoral analyses—electricity, transportation, industry, buildings and agriculture—will be central to identifying solutions and advancing innovation and net zero emissions targets.
<i>Principle #4 Optionality and flexibility are needed for technologies, policies and investments.</i>	Multiple clean energy technology options are needed for each sector of the economy and region of the country—this requires technology and policy options and flexibility.
<i>Principle #5 Technology, business model, and policy innovations are essential.</i>	Innovations in technology, business models, and policy are essential for meeting deep decarbonization targets by midcentury.

For the purpose of today’s hearing, I will focus on the first two principles.

Principle #1 - Broad And Inclusive Coalitions Must Be Built

Coalition-building is essential to the success of the clean energy transition. The lack of focus on coalition-building has hamstrung coherent and comprehensive climate policy and mitigation efforts, hampering our ability to rapidly move forward with effective responses. High-impact coalitions must be committed to deep decarbonization, as well as recognize that their members will have a range of interests and be impacted very differently by mitigation pathways. Coalitions are also critical for acknowledging and effectively addressing the issues of economically dislocated communities, displaced workers and stranded assets that could accompany an accelerated clean energy transition.

Solutions for addressing the climate challenge cut across all sectors of the economy and of our communities. Finding common cause, proactively addressing conflict, and ensuring *all* members of society benefit from the transformation to a low-carbon economy will put wind in the sails of meaningful action. It is fortuitous, therefore, that the growing recognition of the importance of coalitions to climate policy and mitigation is occurring simultaneously with increased climate change commitments by a broad range of stakeholders. For example:



- Subnational entities including 25 states, counties, cities, faith-based organizations, businesses, and academic institutions have committed to doing their part to help meet the U.S. commitments under the Paris Climate Agreement and, increasingly, net-zero commitments.
- Over 2,200 businesses and investors signed the “We Are Still In” coalition pledge, indicating their support for the Paris Agreement, together with states, cities and counties, tribes, health care organizations, cultural institutions, academia and faith groups.
- Of the 274 highest emitting publicly listed companies in the world, 54 percent are now integrating climate change into operational decision-making.
- The U.S. Chamber of Commerce, which represents three million U.S. businesses at home and abroad, issued a statement in March 2019 saying that concrete steps are needed to address climate change and that there is common ground on which “all sides of this discussion could craft real solutions.”
- The National Association of Manufacturers has launched the Energy Advance Center, an initiative that seeks to build partnerships with industry groups that are committed to carbon management policies.
- Last year, at the landmark 2019 Vatican Climate Summit on *The Energy Transition and Care for Our Common Home*, I joined leaders from many of the world’s largest oil and gas companies and investment funds as they committed to adhere to the Paris Agreement and do their part to transition to a low-carbon future. U.S. participants included ExxonMobil, Chevron, ConocoPhillips and Occidental and BlackRock, Vanguard, CalSTRS, CalPERS and State Street Corporation.

Notably, these stakeholders have different goals, measures, timelines, and policy drivers -- underscoring the challenge of achieving ambitious economywide targets absent inclusive and robust, broad-based coalitions and a comprehensive clean energy innovation portfolio. At EFI, we do and will work with all of these sectors and others towards a common goal. For example, I am an individual Founding Member of the Climate Leadership Council⁴ that is advancing the carbon dividend approach created by former Secretaries of State Jim Baker and George Shultz, as I believe that their plan is the starting point for complex discussions on resource allocation, regulatory restructuring and carbon border tariffs.

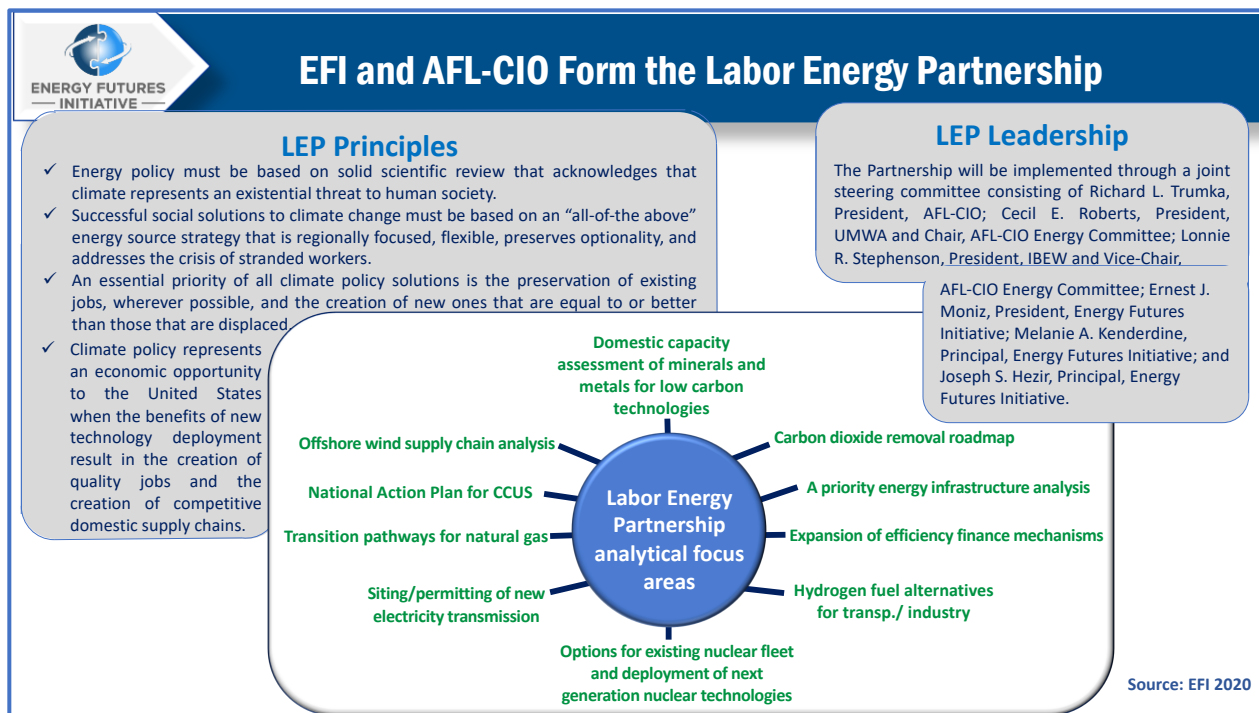
⁴ Hyperlink: [The Climate Leadership Council](#).



The Labor Energy Partnership

In the spirit of coalition building, I am especially pleased that this year on April 22, the American Federation of Labor and Congress of Industrial Organizations (AFL-CIO) and EFI announced the creation of the *Labor Energy Partnership (LEP)*, a joint effort to develop a framework for the 21st century energy system that creates and preserves jobs while addressing the climate crisis. The LEP, jointly staffed by the AFL-CIO and EFI, is based on a shared commitment to high-quality jobs, social equity, and workers’ rights. Richard L. Trumka, President of the AFL-CIO, and I co-chair the steering committee. The LEP will focus its work on a series of critical policy analyses that will provide practical, achievable solutions to the technological, social, and regional barriers to implementing a 21st century clean energy transition with robust good job creation. The schematic in Figure 2 below shows the four principles and 10 anticipated areas of our analytical focus.

FIGURE 2. THE LABOR-ENERGY PARTNERSHIP: LEADERS, PRINCIPLES AND FOCUS AREAS



The four principals guiding the the LEP are:

1. Energy policy must be based on solid scientific review that acknowledges that climate change is real, anthropogenic, and represents an existential threat to human society.



2. Successful social solutions to climate change must be based on an “all-of-the above” energy source strategy that is regionally focused, flexible, preserves optionality, and addresses the crisis of stranded workers.
3. An essential priority of all climate policy solutions is the preservation of existing jobs, wherever possible, and the creation of new ones that are equal to or better than those that are displaced.
4. Climate policy represents an economic opportunity to the United States when the benefits of new technology deployment result in the creation of quality jobs and the creation of competitive domestic supply chains.

While there is a clear synergy between the LEP the GRD, EFI’s focus under the LEP will be specifically on job creation and the development and commercialization of advanced clean energy technologies, such as advanced nuclear technologies, advanced vehicles, offshore wind, carbon capture and storage (CCS, including for natural gas and the industrial sector), carbon direct removal (CDR), hydrogen, low carbon fuels, secure supply chains, and smart and resilient infrastructure. Our focus on job creation will address pathways for expanding job opportunities across all geographic regions and socio-economic groups.

We are already planning our initial workshop for this summer to refine our framing of a range of critical issues before establishing the initial analytical priorities. We will be guided by the four LEP principles and focus on an all-of-the-above energy strategy that recognizes regional differences and preserves optionality as new technologies are developed and deployed.

The Impact of COVID-19, Its Impact on Energy Jobs, and the Potential Role of Energy Jobs in Economic Recovery

Direct impacts on energy arise mostly from the social changes needed to contain COVID-19 and from the associated demand reductions, especially for oil. For example, at one point, oil demand dropped about 30%, and oil prices even went negative briefly because of the demand drop, the Russia-Saudi Arabia increase in production, and the US shortage of storage space.

For the electricity sector, the U.S. Energy Information Administration expects 2020 summer U.S. electricity demand to be at its lowest since 2009. Impacts on demand tell a compelling story for U.S. jobs and the economy: residential demand is projected to be +3%, commercial demand is projected to be -12%, and industrial demand is predicted to be -9%. As an indication of the impact on the economy and jobs associated with COVID-19 and of the need for flexibility for electricity customers’ ability to pay their bills, the Tennessee Valley Authority, a wholesaler, has extended \$1 billion of credit support to local retail power providers. And 71% of power and utility



providers identified “financial impact, including effects on results of operations, future periods of liquidity and capital resources” as their top concern with respect to COVID-19.⁵

As we are all keenly aware, the impact of COVID-19 on U.S. jobs has been devastating, leaving no industry unscathed. It is clear we are in the midst of an economic calamity leading to significant business closures and further job losses, notwithstanding the stimulus packages enacted by Congress to date.

To more fully understand the impacts of COVID-19 on U.S. energy jobs and needs going forward, it is instructive to examine the pre-COVID-19 U.S. energy jobs data from the *2020 U.S. Energy and Employment Report*.⁶ In 2019, U.S. energy, energy efficiency, and motor vehicles firms employed more than 8.27 million Americans, comprising 5.6 percent of the U.S. workforce. Employment in the five energy sectors of the U.S. economy (fuels; electric power generation; transmission, distribution and storage; energy efficiency; and motor vehicles) increased in 2019 by 1.8 percent.

- The Fuels sector employed 1,148,900 Americans, representing an increase of 26,100 jobs or 1.9% in 2019. The oil and natural gas subsectors added the most jobs--more than 18,000, totaling 615,500 oil jobs and 276,000 natural gas jobs.
- The Electric Power Generation Sector employed 896,800 jobs, growing by almost 2.5 percent, gaining over 21,200 jobs. Job losses in nuclear and coal generation were offset by increases in natural gas, solar, wind, CHP, hydropower and geothermal.
- Transmission, Distribution and Storage employed more than 1.4 million, an increase from 2018 of 17,800 new jobs or 1.3%; an additional million Americans are employed in retail (gasoline stations and fuel dealers), for a total of 2.4 million, but these retail jobs have not been included in the Energy total.
- Energy Efficiency employed 2.38 million jobs in the design, installation and manufacture of Energy Efficiency projects and services. Energy Efficiency employers added 54,000 net jobs in 2019, an increase of 3.4%.
- The Motor Vehicles sector employed over 2.55 million, adding 20,000 jobs in 2019, an increase of just under 1 percent.

The USEER also provides four cross cutting analyses that look at the interrelations of jobs across the entire value chain of the natural gas, petroleum, coal and nuclear industries:

- The Natural Gas industry employed 636,042 up 1.7 percent in 2019.
- The Petroleum industry employed 824,290 up 3.1 percent in 2019.
- The Coal industry (including mining and extraction, utilities, and wholesale trade, distribution and transport) employed 185,689, down 5.9 percent from 2018.

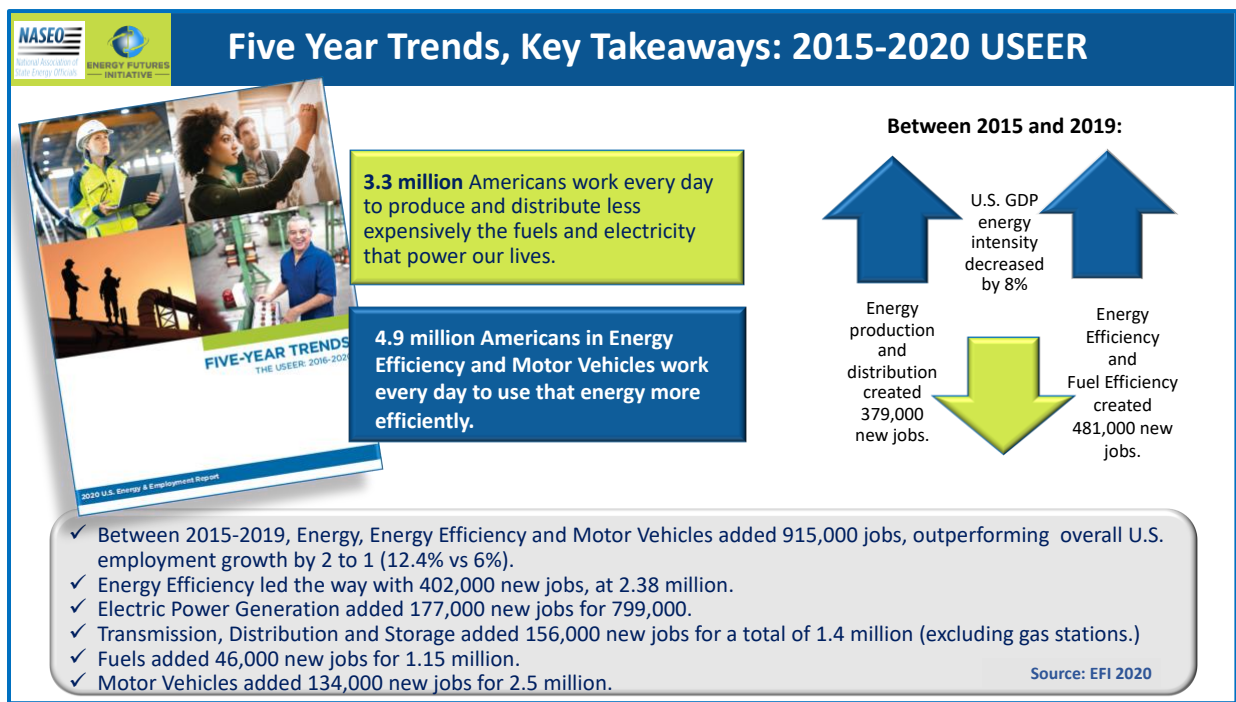
⁵ <https://www.pwc.com/us/en/library/covid-19/how-covid-19-is-impacting-power-and-utilities.html>

⁶ Energy Futures Initiative. (2020). *The U.S. Energy Employment Report*. Washington, DC. www.usenergyjobs.org.



In addition, according to *Five-Year Trends: The USEER: 2016-2020*,⁷ over the past five years, the energy sector created almost 2 million new jobs—while U.S. GDP energy intensity declined by 8%. Energy production and distribution created 379,000 new jobs and energy efficiency and fuel efficiency created 481,000 new jobs. *Energy, Energy Efficiency and Motor Vehicle sectors added 915,000 jobs over the five years, outpacing the overall US employment growth 2 to 1 (12.4% to 6%)*. The Energy Efficiency sector is literally a powerhouse with 2.4 million jobs (about half in construction), adding over 400,000 jobs in 5 years. Figure 3 provides a high-level overview of the five year trends.

FIGURE 3. FIVE-YEAR TRENDS IN US ENERGY JOBS



At the same time, it is important to recognize that diversity continues to be a challenge in the energy sector.⁸

- Women are significantly underrepresented in every technology and every segment of the value chain, at roughly half the participation compared with the overall US workforce.
- Hispanic or Latino workers are well represented in the energy sector overall, close to the representation of Latinos in the workforce generally.

⁷Energy Futures Initiative. (2020). *Five-Year Trends: The USEER: 2016-2020*. Washington, DC.

www.usenergyjobs.org.

⁸ This section draws both from the USEER data and analysis by BW Research Partnership. Additional and detailed information can be found at: <https://www.bwresearch.com/covid/>



- Black workers are underrepresented in every category examined except automobile manufacturing.
- On the plus side, veterans comprise from 8 to 10% of employment in these sectors, higher than the national average of 6%.

Given the incredible job growth of the energy sector over the past decade, this lack of diversity in the energy sector has resulted in women and black workers being underrepresented in one of America’s greatest economic expansions.

In contrast to the overall U.S. energy jobs success story over the past five years, in 2020, the impact of COVID-19 on unemployment is truly a national challenge and the energy sector is no exception. The pattern of job losses by state is seen in Column 2 of Figure 4. The top 10 states in absolute number of unemployment filings is, not surprisingly, seen in states with large populations. When total unemployment filings are, however, normalized as a percentage of a

FIGURE 4. TOP 10 STATES IN UNEMPLOYMENT CLAIMS AND ENERGY EMPLOYMENT BY KEY ENERGY SUBSECTORS

Top 10 States Unemployment Claims (3/21-06/6), Top 10 States for Employment in Key Energy Job Categories (2019)												
Ranking of Top 10 States, Highest to Lowest	Total Unemployment Claims (03/16-06/06)	Claims as % of Workforce	Natural Gas and Oil Fuels Jobs Actual	Natural Gas and Oil Fuels Jobs as % of Workforce	Efficiency Jobs Actual	Efficiency Jobs as % of Workforce	Gas/Oil Generation Actual	Gas/Oil Generation as % of Workforce	Solar Generation Jobs Actual	Solar Generation Jobs as % of Workforce	Wind Generation Jobs Actual	Wind Generation Jobs as % of Workforce
1	CA	GA (47.8%)	TX	WY	CA	VT	CA	KS	CA	NV	TX	ND
2	FL	KY (44.3%)	LA	ND	TX	WY	FL	HI	MA	HI	IL	SD
3	NY	HI (38.4%)	OK	AK	NY	DE	TX	NH	NY	CA	CO	CO
4	GA	AK (34.6%)	CA	OK	FL	RI	KS	UT	FL	VT	IN	IA
5	TX	WA (33.6%)	PA	LA	IL	MA	NY	FL	TX	UT	CA	IN
6	PA	LA (32.9%)	CO	NM	MA	MD	MA	AK	NV	MA	FL	ME
7	OH	NV (31.8%)	NM	TX	NC	WI	IL	MA	AZ	NM	MI	TX
8	MI	MI (31.8%)	IL	WV	MI	OR	AZ	SC	NJ	OR	IA	NH
9	WA	RI (31.1%)	ND	CO	OH	UT	MI	AZ	NC	AZ	NY	KS
10	IL	OK (31.1%)	OH	KS	VA	CT	OH	MS	OH	CO	WA	IL
Total US*	40,754,311		906,998		2,378,893		128,031		345,393		114,774	

Bold denotes top 10 states that are in top 10 for actual unemployment claims or claims as percent of workforce and are also in top 10 jobs for specific energy sector, both actual an/or as % of workforce. *Includes DC and Puerto Rico

Source: Department of Labor, “Unemployment Insurance Weekly Claims” <https://www.dol.gov/ui/data.pdf>

state’s total workforce, different states comprise the top 10, e.g., Georgia and Kentucky top the list, compared to California and Florida, which top the list in absolute unemployment claims (although Georgia and Michigan are on both lists). Figure 4 also highlights the top 10 states for



number of jobs, both actual and as a percent of the workforce, in several energy sectors: oil and gas fuels; energy efficiency; natural gas and oil power generation; wind generation; and solar generation. This points to their potential for job creation, as well as for coalition building as we work on investments in transitioning to clean energy systems.

What these rankings illustrate, for example, is that Texas is number five in total unemployment claims but number one in both oil and gas fuels and wind jobs. Pennsylvania is number 6 in unemployment claims and number 5 in oil and gas fuels jobs. Ohio is 10th in oil and gas fuel jobs as well as in solar jobs. Florida is number 2 in unemployment claims and oil and gas generation jobs, as well as number 4 in solar jobs. Michigan is number 8 in unemployment filings, both actual and as a percent of workforce, as well as number 9 in gas/oil generation jobs and number seven in wind jobs. States with smaller populations also suffer major impacts as they often rise to the top of the lists of energy jobs as a percentage of the total workforce. The actual and relative importance of energy jobs in states hardest hit by COVID-19-related unemployment and the cross-cutting interests in both conventional and clean energy jobs should be considered as we transition our energy systems to ensure that we do not strand workers as we build out new clean energy infrastructures and systems.

In terms of the ongoing impact of COVID-19 on the energy sector, there are many unanswered questions.

- As much as 50% of the US workforce has been working remotely (generally with surprisingly high productivity--and EFI fits in that category). This has a profound impact on fuels demand, especially for automobiles and airplanes. Will much of this persist post-COVID-19? Will remote work productivity remain high when the society is fully re-opened?
- Public transport development has been a pillar of sustainable city design and intercity travel discussions. Will the public be post-pandemic averse to the relatively close quarters often experienced in public transport? Will automobile commuting increase? Will micro-mobility get yet an additional impetus?
- How will cityscapes change? Will office space needs contract dramatically, perhaps with a move to more "hoteling" arrangements? Will there be widespread conversion to residential space? Will "smart cities" be taken to a new level?
- How will "rural-scapes" change? Will the positive experience during COVID-19 of remote working lead to a move by many to more rural locations? Will we implement universal broadband access to enable this?



These are just some of the questions that are not credibly answerable today. The answers, however, will have measureable impacts on energy systems in the future, with unclear net impacts on greenhouse gas emissions. The biggest wild card, however, may be that if pandemic preparedness is not dramatically improved and another so-called “once-in-a-century” pandemic strikes again soon, we can expect the answers to the above questions to tip in the direction of more extensive change and more profound impacts on energy systems. Even without another pandemic, COVID-19’s lasting impact may be an increase in the percentage of the U.S. workforce working from home together with increased geographic dispersion possibly to less urban and more rural areas. This impact underscores the importance of information and communications technologies – and universal broadband upon which they depend, together with an electricity system that is affordable, accessible, reliable and cybersecure.

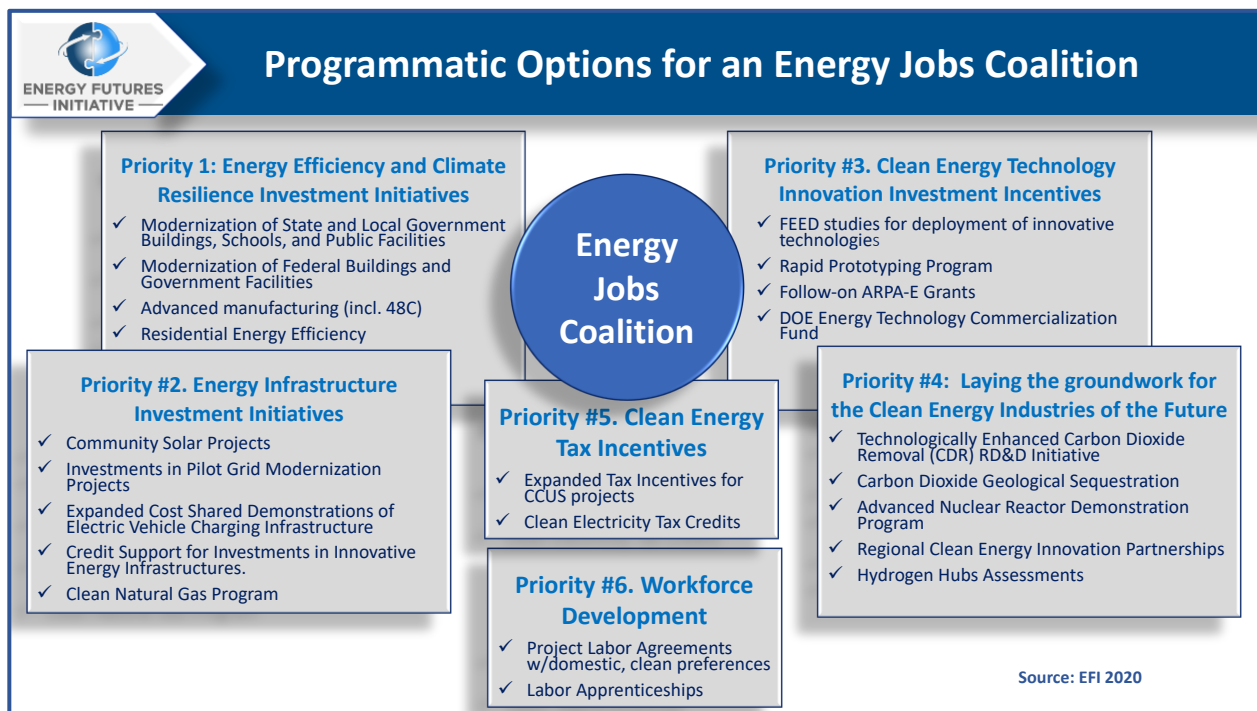
What will the recovery be like? The U.S. witnessed an unprecedented number of unemployment claims in a short time: over 42 million between March and June, with over 20 million just in the month of April. Sunny predictions of a rapid return to the status quo ante are simply not credible. Stock price recovery is not the same as economic recovery especially if unemployment remains at “recession levels” for an extended period. The U.S. Federal Reserve projects a slow recovery with unemployment predicted at 9.3% by the end of the year, but the unknown trajectory of the coronavirus – especially in light of the increase of COVID-19 cases since many states started reopening – injects a huge amount of uncertainty, with surprises most likely on the negative side.

The Role of the Clean Energy Transition and U.S. Job Growth

We will need millions of *new* jobs in order to climb out of the COVID-19-induced economic hole. The U.S. recovery will extend at least into 2021 and likely beyond and it will undoubtedly require additional extraordinary actions by the Federal government, including the Federal Reserve. These actions should be aligned with directions that we need to be heading in anyway, including the clean energy transition and its associated major energy infrastructure needs. Given the demonstrated track record of the energy sector as having considerable leverage for job creation, major investments now in the clean energy transition should have a high priority for strategically important projects that will propel job growth in the near, medium- and longer-term time frames.

In an opinion piece published in The Hill on April 3 (attached), I outlined how an energy jobs coalition could help get the U.S. economy back on track. As you can see in Figure 5, our proposed energy jobs coalition identifies six priority areas and 22 initiatives that could revitalize the U.S. economy and energy jobs.

FIGURE 5. POSSIBLE PROGRAMMATIC OPTIONS FOR AN ENERGY JOBS COALITION



The first priority area includes energy efficiency. We know that continuing energy efficiency gains in buildings, transportation and industry make both environmental and economic sense. We saw that the energy efficiency subsector employs 2.4 million Americans, with about half in construction and many of the rest in design, manufacture, delivery and installation of Energy Star products. Many efficiency projects can get a rapid kickstart, even if the COVID-19 pandemic lingers. One example is modernization and efficiency upgrades of federal, state and local government buildings, schools and public facilities. Such buildings, both urban and rural, typically have large parts of the day when they have very few staff present, so concerns about



bringing workers into residential environments will be absent for many public buildings. A similar argument could be made for many commercial buildings, especially small and medium sized enterprises. Delivery mechanisms can be through established programs in order to get a quick start (for example, existing energy savings performance contractors to government, or utility efficiency programs for commercial customers). Clearly residential efficiency programs also remain very important when access is safe in the post-COVID-19 world.

A second priority is energy infrastructure investments. It is clear that the electricity sector is leading and will continue to lead the low carbon transition. To achieve carbon net zero by mid-century across the economy, the electricity sector will need to reach that point earlier, by 2040, and ideally even earlier, perhaps by 2035, because success in some of the harder to decarbonize sectors, such as transportation, buildings and industry, depend on expanded electrification. Many initiatives, such as grid modernization and national EV fast-charging infrastructure, have the potential to unleash new markets and entrepreneurial activity. Another example, perhaps less evident, would be investment in a system of community solar projects, typically in the 1-5 MW range. These have the advantage mentioned above of being construction projects that can be carried out, with reasonable precautions, at almost any stage of the COVID-19 pandemic given the nature of the work. States could examine and, where necessary, update their regulatory environment to enable rapid expansion of community solar. Natural gas will also continue to play an important role throughout the clean energy transition, including as an enabler for rapid expansion of wind and solar deployment.

The push on decarbonizing electricity will also give the U.S. a leg up in decarbonizing other sectors, since CCS, hydrogen and carbon dioxide removal (CDR) will be needed across the energy economy in addition to sector-specific technologies. The combination of decarbonized electricity, a vast hydrogen economy, the associated continental-scale infrastructures plus CDR can in principle meet all of the energy services needed, with reliability and resilience, while driving a deep decarbonization of the economy by mid-century. However, other fuel technologies, such as advanced cellulosic biofuels and other low carbon fuels (such as renewable natural gas) can also play critical roles provided innovation significantly lowers their cost. This reinforces the need for a supercharged decade of clean energy innovation, with no time to waste.

A third priority is technology innovation investment. The last decade has seen bipartisan support for the innovation agenda, such as establishment and expansion of ARPA-E. That single program has produced the better part of a hundred early stage companies. A program to assist follow-on activity could be highly effective, such as support for front end engineering design, rapid prototyping and novel arrangements for partnering with DOE labs on the way to full commercialization.



A fourth priority would be laying the groundwork for what I refer to as the “Clean Energy Industries of the Future.” The federal government needs to increase its investment in basic research, deployment incentives and enablement of novel public-private partnerships. For example, the innovation budget for research, development and demonstration will need to double or triple over this decade to position the U.S. for success in addressing the climate crisis and social equity challenges, and for establishing an unrivaled competitive position--with enhanced domestic supply chains--for a multi-trillion dollar global business. In addition to expanded deployment of renewables, we should literally be thinking about new industries, not just specific technologies:

- Electricity storage at all time scales, including weekly, monthly and seasonal;
- CCS and its associated infrastructure;
- Advanced nuclear, including small modular reactors and microreactors, as well as novel fusion technology;
- Hydrogen;
- New infrastructures including long distance high voltage transmission, CO₂ pipelines, hydrogen storage and transportation, EV fast charging, smart electricity distribution systems, resilient natural gas systems;
- Secure domestic supply chains, including environmentally sound mining of the critical minerals and metals that will be in much greater demand as clean energy technology deploys at massive scale (for example, one massive offshore wind turbine with current magnet technology will need a ton of neodymium, a rare earth element that today is more than 80% sourced in China); and
- Negative carbon technologies: carbon dioxide removal (CDR) from the atmosphere, and possibly from the ocean, by natural, technological and technology-enhanced natural processes.

As a concrete example of what’s needed, EFI published last September an extensive analysis on the needed CDR RD&D portfolio: *Clearing the Air: A Federal RD&D Initiative and Management Plan for Carbon Dioxide Removal Technologies*.⁹ We concluded that about \$10 billion is needed over the next decade. Further, the program would have DOE in the lead, but the U.S. Department of Agriculture, National Science Foundation and Department of Commerce (National Oceanic and Atmosphere Administration) would all play important roles, and yet another seven agencies would be contributors. This demonstrates how both the Administration and Congress must address organizational fragmentation that could otherwise impede CDR and other important crosscutting programs. The importance of CDR specifically cannot be overstated: it holds the possibility of both net-zero and ultimately net-negative emissions for the U.S. and global economy.

⁹ Hyperlink: [Clearing the Air: A Federal RD&D Initiative and Management Plan for Carbon Dioxide Removal Technologies. Washington, DC.](#)



Getting out of the box quickly on building the “Clean Energy Industries of the Future” can pay job dividends early on. For example, the bipartisan 45Q tax credit that enables CCS requires projects to start construction by the end of 2023. Doing so has major job implications. We all know that the oil industry is facing considerable uncertainty because of post-COVID-19 demand volatility and because of the secular change facing the industry with a low-carbon future. However, the capabilities needed for large scale CO₂ sequestration are much the same as those employed in the oil industry, and an eventual major CCS industry, measured in gigatons of CO₂ per year, will have a scale similar to that of oil. A smooth transition for workers and communities is within our reach if we plan for it.

A fifth priority is tax incentives for moving to a low carbon economy. The aforementioned 45Q credits should be strengthened to kick start CCS, for example, by extending the project start date requirement in recognition of the delays caused by the COVID-19 pandemic. Renewable technologies, such as offshore wind, clearly deserve continuing tax incentives on the investment or production side.

Lastly, a sixth priority is workforce development which is needed to build the “Clean Energy Industries of the Future.” This is why EFI partnered with the AFL-CIO to create the Labor Energy Partnership. We note that by far the key to workforce development is creating new jobs, supplemented by training and retraining our workforce to meet the needs. Supporting project work agreements and labor apprenticeships will also move the needle. AFL-CIO President Trumka has emphasized that the labor unions do more job training than any other US organization except the military, produce highly skilled workers and pay them during their apprentice period. Government assistance should help expand these programs (not venture into new requirements). With unemployment higher in the last three months of COVID-19 than in two years of the Great Recession, job creation is the key, and job creation is needed now to address persistent recession-level unemployment.

Conclusion

COVID-19 and climate change have unfolded over very different time scales, but also have a number of commonalities. COVID--19 hit hard and fast with immediate and devastating global health and economic impacts. We are hopeful that COVID-19 will become a manageable health issue through the development and distribution of vaccines as well as effective treatments for those with infections. On the other hand, we have already had five major epidemics/pandemics in this century¹⁰, including two previous coronaviruses, without triggering anything close to a sufficient response for pandemic preparedness.

¹⁰ SARS (2002), H1N1 swine flu (2009), MERS (2012), West-African Ebola (2013, 2016), and Zika fever (2015 and 2016).



In contrast, climate change is a growing global threat that we have recognized for decades. Many communities and regions are already experiencing severe and devastating consequences of climate change, such as extreme weather, rising sea levels, major storm surges, fires, floods, droughts and increased harmful insect ranges. Yet, somewhat like the pattern of international epidemics recurring every three years without adequate actions, responses to the impacts of climate change have not been sufficiently focused or urgent. Climate change will require both mitigation and adaptation for the duration of this century, and our capacity to respond will be compromised the longer we wait.

Two lessons should be clear from our collective lack of preparedness for the current pandemic that are, however, relevant to both energy jobs and our response to climate change going forward: we must heed what science is telling us and act accordingly; and government must do a better job at its core function of risk management and economic stimulus. Elected federal officials, in both the Executive and Legislative branches of government, have a unique opportunity and responsibility to address long term risk management for the entire country.

Second, the response to the virus has increased our awareness of and focus on supply chains, an issue that also needs to be understood in the clean energy transition. This is not a call to protectionism but rather an alert to our need to implement market structures that reflect economic, environmental and national security.

One direction that is extremely likely to persist under any of the scenarios above: the move to a low carbon energy systems will continue. The evolution of “natural” events towards more extremes and the dramatically increasing costs of adaptation will continue to drive communities, business leaders, elected officials and others to support innovations in technology, policy and business models needed to mitigate climate change. This is the only prudent way to exercise risk management.

Thank you for the opportunity to appear before you today to discuss these important and timely issues. I look forward to your comments and questions.



How an energy jobs coalition can help the US economy bounce back

By Ernest J. Moniz

The chorus is growing louder: in addition to halting the increases in coronavirus cases, we need an energy stimulus package focused on rebuilding the economy. Job creation and infrastructure development will be key.

With unemployment filings reaching nearly [10 million](#), it is clear we are in the midst of an economic calamity leading to significant business closures and further job losses, despite the stimulus packages enacted by Congress to date. We need to create new jobs, protect the livelihoods of American people and ensure the future resilience of our economy.

In normal times and in crisis, we are completely reliant on energy, water, transportation, communications and finance infrastructures to keep our economy running. Energy has a special place in this critical infrastructure mix. The [Department of Homeland Security](#) describes it as the “[key enabler of all other infrastructures...](#)” Without a stable energy supply, health and welfare are threatened, and the U.S. economy cannot function.”

Within the energy sector, electricity — [the “uber” infrastructure on which all others rely](#) — deserves special attention. It is essential for running our hospitals, operating ventilators, charging our phones and computers and communicating via internet-enabled video conferencing — critical for our current makeshift economy.

The energy sector — in the early stages of a low-carbon transition — has seen natural gas, renewables, storage and efficiency play a greatly expanded role over the last decade and is a powerful job creator. The recently-released [2020 U.S. Energy and Employment Report](#) underscores this connection: while the energy and auto sectors make up 5.4 percent of the American workforce,

they created 10.7 percent of all new jobs since 2015. Translation: [915,000 new jobs, over 40 percent of them in energy efficiency alone.](#)

This argues for a prominent position for energy in the next stimulus package. The federal efforts during the Depression of the 1930’s and the Great Recession of 2008-2009 are noteworthy in this regard.

During the Depression, the Civilian Conservation Corps, Rural Electrification Administration, [Tennessee Valley Authority](#) and Bonneville Power Authority were established to repair and build infrastructure, initiate large scale hydropower for electricity generation and take electricity to every home and farm. Three of these programs were principally energy-related — the REA alone supported the formation of 800 rural electric co-ops and the construction of 350,000 miles of power lines.

The [American Recovery and Reinvestment Act](#) also had a significant energy focus. It kickstarted a rapid expansion of on-shore wind, initiated large scale solar deployment, supported the first commercial scale carbon dioxide capture and sequestration facility at a coal plant and laid the foundations for the development of “smart” energy systems — as well as creating a new approach to clean energy innovation, ARPA-E, which has [spawned over 80 start-ups.](#)

As the public and private sectors turn their attention to rebuilding our economy, we need to seed new industries that underpin our low-carbon future and build infrastructure aligned with that future. We don’t need a physical “corps” or new federal organization as in the 1930s — our energy systems are largely operated by the private sector



and have vast infrastructures in place. But we do need an energy stimulus program built on the foundation of an “Energy Jobs Coalition” (EJC) to keep the focus on energy infrastructure modernization and job creation through 2021 and a platform for further job growth after that.

What programs might be supported by an Energy Jobs Coalition in a new stimulus package?

Clearly, immediate relief for modest income families must remain paramount, for example, by supporting additional low-income energy assistance through the [Low Income Home Energy Assistance Program](#). Grants could also support electricity and gas distribution companies to enhance their energy efficiency programs, especially for low-income households and small businesses.

EJC-supported programs could include capital improvements that substantially increase energy efficiency in public buildings — courthouses, city halls, etc. This is especially important for rural areas where declines in population and high unemployment have reduced tax bases. Federal buildings could be improved through an amped-up [Federal Energy Management Program](#), saving money on utility bills that could be spent elsewhere.

In addition, the EJC should support grid infrastructure modernization. A cost-share program to automate substations, for example, would further enable distributed generation while helping to protect the grid from cyber-attacks. Modern energy systems should be designed to support job growth while remaining aligned with the active clean energy transition.

Programs should support the decarbonization of incumbent energy systems, such as natural gas, by providing cost-share funds to reduce natural gas flaring, produce renewable gas from landfill and agricultural waste. They should also support state grants for offsetting the cost to low-income consumers associated with replacing gas

distribution systems that are leaking methane.

The coalition’s focus could also include clean energy industry creation through both innovation and deployment investments. There are many candidates: [advanced battery technologies and long-duration electricity storage](#), clean hydrogen supply and infrastructure, establishing [regional technology innovation hubs](#), modular nuclear reactors, a new generation of carbon capture and [removal projects](#) — from power plants — industrial facilities and the air, offshore wind, integration of energy networks with artificial intelligence and big data capabilities, and more.

This should be paired with financing initiatives, such as renewable, advanced nuclear and carbon dioxide utilization and sequestration tax credits, an expanded loan program for supporting [state Green Banks](#) and clean energy for tribal lands and indigenous communities. In addition, perhaps the Clean Energy Deployment Administration — which had bipartisan support a decade ago — should be reconsidered.

Job creation in all of these areas should be underpinned by a network of private, public and union-supported apprenticeship and training programs that directly address the need for an expanded energy workforce. For example, the [Building Trades Union](#) alone offers training and apprenticeships at over 1,500 locations across the country.

While this is not an exhaustive list, it offers some examples of what an Energy Jobs Coalition could support in a new stimulus package — good for American workers, our economy and the planet.

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